Items #68: Vegetation Composition, Structure, and Landscape Pattern

Evaluation Question: How do existing conditions compare with the estimated range of natural variability?

Resources to be measured: Composition, structure, pattern by subbasin

Data Sources:

- Forest Plan Amendment 21, forest activity database (FACTS) and fire history data

This monitoring item was established in 1999 with completion of Amendment 21 to the Forest Plan and was designed to look at changes in overall vegetation over time. This item has not been reported previously. Item 70 is related, and addresses within-stand structure of snags and coarse woody debris.

During the preparation of Amendment 21 (A-21), extensive analysis of both current and historical vegetation conditions was conducted using a variety of tools. Data was summarized in several formats, most specifically by subbasin and potential vegetation group. Columbia River Basin modeling over a 400 year period was used to produce estimates of the historical range of variability. This data provides a baseline for looking at future vegetation changes. The figures and text on page 39 to 47 of the amendment provide great detail.

In general, late-seral forest was found to be below historical minimums in all sub-basins in all community types. In most sub-basins and types, mid-seral forest exceeded the historical maximums. Early seral varied by sub-basin, being within historic ranges in some drainages, and below historic minimums in others.

All sub-basins reflect high variability in vegetative composition, reflective of the general influence of long-fire intervals in our forests, and past large-scale stand-replacing fires. Harvest activity has been a factor in the reduction of late-seral forest, and the change in species composition in some areas. Overall, there is a dramatic increase in mid-seral forests and shade tolerant tree species. Forest structure has changed, resulting in a more homogeneous landscape pattern at greater risk of fire, insect, disease, and stress.

In addition, forest patch size in late and early seral had been significantly reduced from historical, based on the small scale patchwork of management activities. Mid-seral patch size has increased.

Since the time of the A-21 analysis, from 1999 to 2008, harvest, fuels treatment and fire have made some change to those conditions. Approximately 0.9% of the forest has had regeneration harvest, typically changing mid or late seral forest to early seral. Approximately 0.4% of the forest has had thinning which does not change the seral condition of harvested areas. Overall, this change in 1.3% of the forest (or 3.9% of the suitable timber base) would not significantly alter the trends identified during the A-21 analysis. In addition, approximately 0.8% of the forest has had fuels treatment accomplished.

By comparison, since 1999, 15% of the forest has had some intensity of wildfire, which may or may not have change seral stage classification. In addition, 1.7% of the burned are has been salvaged, representing 0.2% of the total forest area that has had salvage after wildfire.

Specific inventory data is not available to assess the successional changes for all areas burned. However, past analysis of ten large fires on the Flathead NF indicated that an average of 47% of the fire area within the fire perimeter burned with a high severity, killing most trees, and returning areas to an early seral stage. An average of 25% was classified as moderate severity burn, with mixed impacts on vegetation -- smaller and less fire resistant trees might be killed, but larger more fire resistant trees would generally survive. The remaining 28% of fire areas were classified as low severity or unburned, where fire generally stayed on the ground, affecting smaller trees and vegetation, but seral class would be unchanged. These estimates are likely to be conservative, as they are based on conditions immediately following fires, and do not account for mortality in successive years due to stress and insect and disease activity.

Table 68-1. Acres Burned From 1998 to 2008 by Sub-basin

Sub-basin	All Ownerships Burned	% of All Lands in Sub-basin	FS Acres Burned	% of FS Lands in Sub-basin
North Fork	166,002	27%	70,621	24%
Middle Fork	123,658	17%	49,658	13%
Flathead Lake	No data available for valley bottom			
South Fork	183,901	17%	183,874	18%
Salish	26,316	5%	25,806	12%
Swan Valley	13,342	3%	11,003	4%
Grand Total	**513,232**	**12%**	**340,966**	**15%**

Within the suitable timber base, a similar percentage, approximately 13% of lands burned. The majority of the area burned in this timeframe occurred outside the suitable timber base, including within wilderness, where some fires have been managed for resource benefits. It does not appear that there has been a disproportionate area burned within the part of the forest where timber management is emphasized.

Some additional small scale changes have occurred due to other natural processes including blowdown and insect and disease activity. There is no forest data available to quantify these changes, but over time, Forest Inventory and Analysis (FIA) data will reflect these changes.

Evaluation

While data is not available to the specificity of the original Amendment 21 analysis, some inferences can be drawn from the brief summary of recent changes.

Fire has caused sizeable changes on the landscape in the last decade, dwarfing the impacts due to forest management. The magnitude of change on the landscape over the last decade due to harvest represents only 9% of the total change that has occurred.

Due to the high variability of historical conditions, we cannot conclude that the extent of fire in the last decade is outside the historical range. Large stand replacing wildfires have always been part of the natural processes which have shaped historical conditions on the forest. Much of the mature forest visible today is from a series of large fires which occurred between 1910 and 1929 when more than 800,000 acres burned in the Flathead Valley (data from A21, includes all ownerships).

Fires, as well as regeneration harvests, have a tendency to "reset" areas towards more shade intolerant species of western larch, lodgepole pine, and Douglas-fir, moving towards historical conditions. However, modern day large fires in western Montana are generally larger, and often more intense than historical, due to their greater fuel loadings and recent drought conditions (Keane and others, 2002). This may result in subtle or not so subtle shifts in species composition and stand structure compared to historical conditions. These sorts of changes can only be witnessed over large areas and long timeframes

Fire also has a tendency to move areas back towards larger patch sizes which have historically been the norm. Harvest has a tendency to occur on smaller areas, causing some degree of fragmentation of the landscape, more similar to the results of mixed-severity fires.

Particularly within the North Fork of the Flathead Forest, change due to natural causes has altered both the composition and structure of the landscape to a considerable degree in the last decade. These changes benefit some species of plants and animals, while being a detriment to others. Other drainages have been impacted to lesser degrees by fire.

In the future, FIA data can be used to more systematically track these changes in forest composition and structure over longer timeframes.

Recommended Actions

- Continue to monitor broad-scale changes in vegetation due to natural processes as well as management. During Forest Plan Revision we may choose to use FIA data to create a new forest-wide baseline, which can then be re-summarized on a 10-year basis. A new national system for tracking burn severity over time (www.mtbs.gov) may provide additional useful data. Broad scale remote sensing mapping efforts such as VMAP could also be used to monitor changes in forest pattern.
- Continue to use both harvest and fire as tools to move towards desired vegetation conditions, more consistent with the historical range of variability

REFERENCE:

Keane, Robert E. Ryan Kevin C., and others, Cascading effects of fire exclusion in the Rocky Mountain ecosystems: a literature review. General Technical Report, RMRS-GTR-91. Fort Collins CO: USDA, Forest Service, Rocky Mountain Research Station, 2002